

# Design of Grid Slab/Floor

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## ABSTRACT

Grid slab/floor are designed for long span structure where no intermediate columns are provided in order to accumulate large public gathering, meeting assembly etc. the design for stable, compatible structure for long term serviceability. the spacing of ribs play an important role in stiffness, deformation of the entire structure the grid are modeled using etabs taking 3 grid of different spaced such as 750mm, 1000mm, 1250mm are modeled and their results are computed and checked with IS codal provisions by using etabs software.

**KEYWORDS:** flexure, stiffness, grid spacing

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## INTRODUCTION

Grid floor is an assembly of intersecting beam at regular interval and interconnected to a slab of nominal thickness is known as grid floor. these slab covers large free area and therefore it is adopted for public hall its pleasant appearance and less maintenance cost, however construction of a grid slab is cost prohibit. A waffle slab is a type is a type of building material that has two direction reinforcement. These types of floor are used to cover a large obstruction free area and therefore a good choice for public assembly hall. the grid structure is monolithic and stiffer in nature. By inspecting various parameter involved, a cost effective solution can be found for grid floor. The present work includes the investigative parameter in terms of flexural action such bending moment, torsion and shear force, spacing of grid are the parameter considered for design and the results are evaluated. the other parameter considered for investigation is the depth of grid beam along with the design feasibility.

## LITERATURE REVIEW

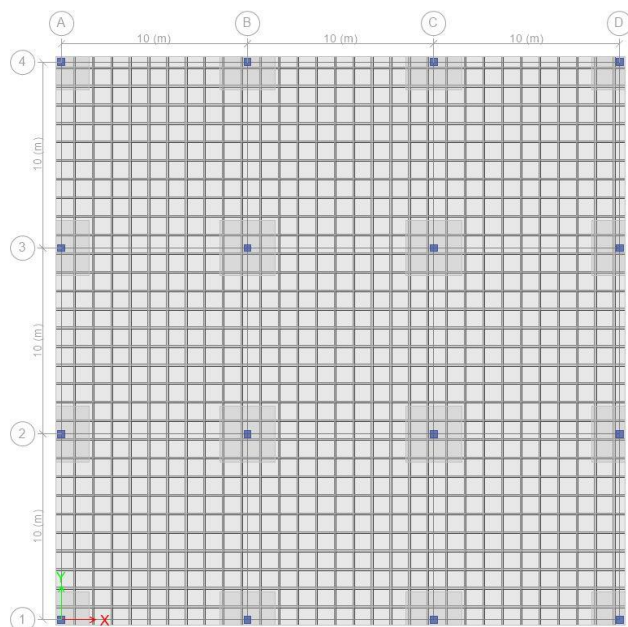
**1 S. Vepari and Dr HS Patel** have studied economically aspect of land span of grid slab. In grid slab as the span range increases in the unit cost is not significant. Flat slab with smaller span are proven to be economical but as span increases the grid slab become economical thus grid slab is proven to be more economical for long span is compared to flat slab. In this case study flat slab and grid model are modeled by using etabs and their various parameter are analysed the stiffness of the structure are computed by etabs

the analysis of the result are taken for modeling in this project.

**2. J Prasad, S CHANDER AND A K AHUJA** carried opt analysis study on square waffle slab medium sized floor system with view to achieve the optimum dimension of ribs spacing, depth and width of grid slab, the analytical include various series of step for optimum design various trail and arrow are done iteration process carried out for design.

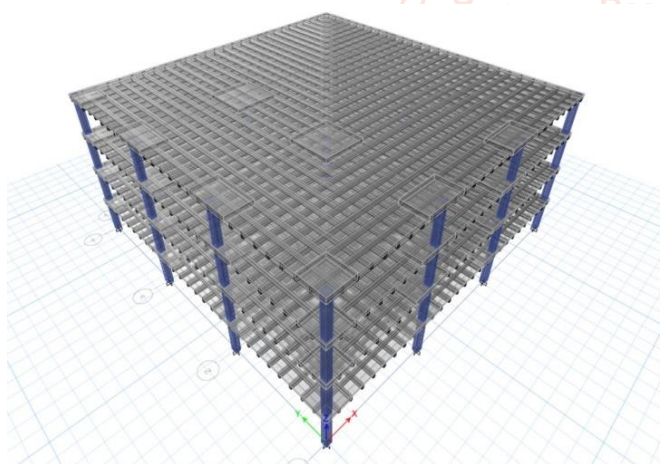
**3. Bhatia NK** studied the response of grid slab in conventional RCC building structures were given different geometrical shapes then each of them analysed using response spectrum, their result and performance and structural characteristics of grid slab are more effective over conventional slab, it is seen in term of material cost and deflection

**4. Mohana** has presented journal regarding the comparative study of grid slab and conventional slab by using etabs for different zones of India and analysed G+5 commercial multistory building parameter such has base shear, axial force, storey drift and displacement. The difference in storey drift is more in ordinary structures.

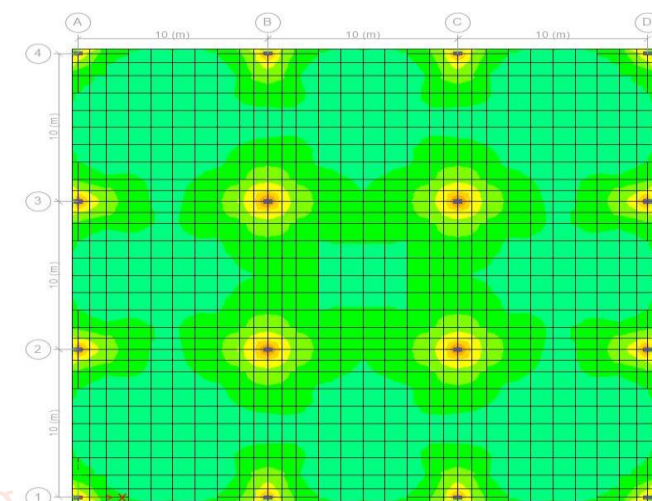


**GRID SLAB OF RIB SPACING 1000MM**

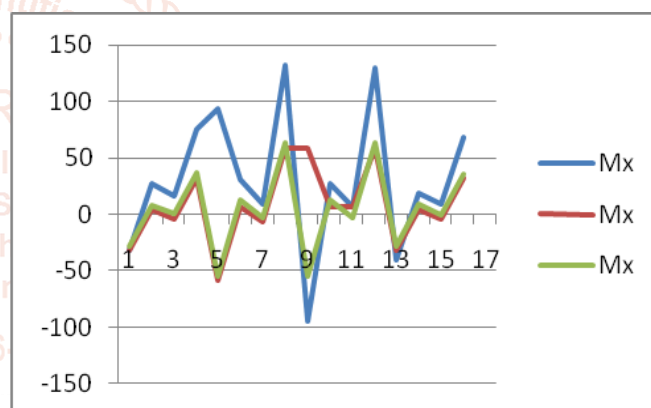
The etabs model consists 3 model of different spaced grid 750mm,1000mm,1250mm are modeled, with drop panel of 100mm.the plan area of grid model is 40mx40m with slab thickness of 100mm.the column of dimension 230x450mm are placed between 10m. no of stories 5.the floor to floor height is 3m. the material properties are concrete of m25 grade concrete, fe500 grade concrete. the loads assigned are live load of 3kn/m<sup>2</sup> and additional dead load of 1kn/m<sup>2</sup>. the model is loaded with dead load, live load, seismic load EQx, EQy taking factors of coefficient if their load combination.



**3D MODAL OF GRID MODAL**



**Stress distribution across column**



**Nodal moment of different spaced grid**

### SPACING OF GRID

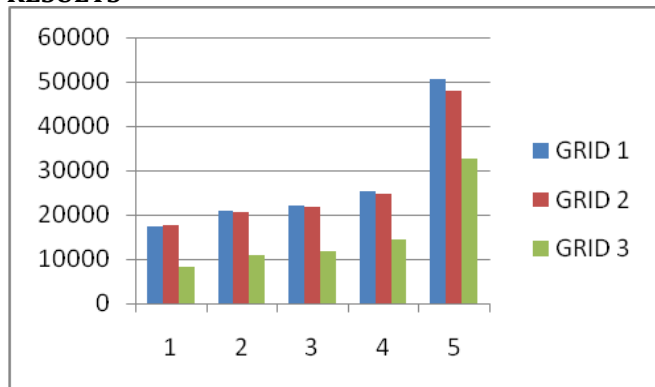
After analyzing sampling grids, it is observed that grid spacing affects bending moment in all column junctions. Therefore, study of variation of spacing of grid beam for various l/b ratios are carried out. For this reason for given length and breadth the ratio of spacing of hall with varied l/b ratio. As l/b ratio increases at inter of 25m. the spacing of grid beam along the width of span is kept at constant 1.0m, and spacing along the length of hall is varied by dividend along the length.

The analysis is carried out for different grid having different l/b ratio with sizes. 75x75 m, 1x1 m, 1.25x1.25 m. The variations of bending moment in column junction are studied. The graphical variation of bending moment along different position of grid are studied

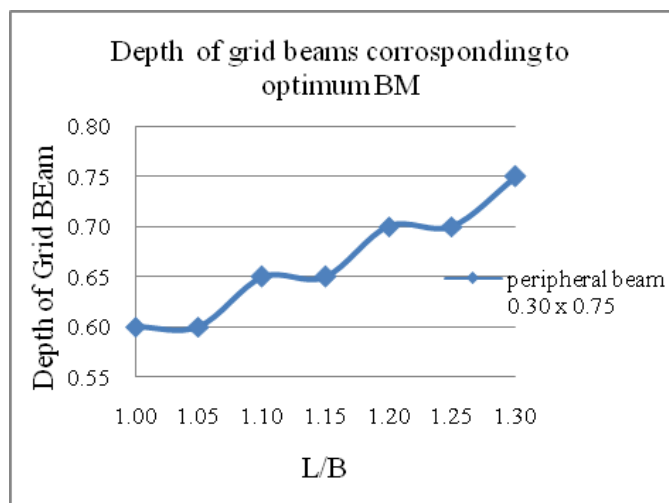
### DEPTH OF GRID

The parameter considered depth of grid. it is observed that considering bending moment in grid. The maximum bending moment in grid beam is quite less as compared to maximum bending moment in column junction. Therefore, the depth of grid need not be same in end column.

### RESULTS



**STIFFNESS OF GRID**



The variation of maximum bending moment in periphery grid wrt to l/b ratio of spacing of grid, it is observed that max bending moment in periphery grid increases with increases in l/b ratio.

Rate of increases of flexure in periphery grid is alike. The linearity of the variation of max bending moment in periphery grid changes with increases of l/b ratio. It is observed to be non linear for l/b ratio less than 1.45. It is observed flexure in beam decreases to certain nodes.

The afterward it increase with increases l/b ratio of spacing grid. ter 1.45 l/b ratio the flexure is optimized and higher than for smaller l/b valve.

### Conclusion

1. The flexural action in end columns can be minimized span dimension less than 1.4 with minimum ratio of grid. The square grid is most economical. for span size l/b greater than 1.5m the spacing of rid can be minimized, which produces minimum bending in column drop
2. The stiffness of model of different sized grid varies linearly decreasing, as size of the grid increases, the stiffness of the model decreases due to maximum deformation in the grid model

3. Maximum shear force in periphery grid increases with increases in depth of grid
4. For given depth grid, the torsional moment in grid goes on decreasing with increase in size of grid, the maximum torsional moment in grid is minimum when depth of grid and rib are equal acts as a conventional slab
5. From design point of view, the depth of grid corresponding to optimum value of maximum flexure in end column is feasible.
6. The depth of the grid can be optimized effectively than the depth of grid, for the hall size having l/b ratio of 1.15, for larger span l/b ratio the depth of the grid has to be increased such has overall depth 500mm.
7. For governing the bending moment in the column junction the l/b ratio should be taken as 1,1.25 as we increase more than 1.25m optimization is not observed, for span having l/b ratio more than 1.25m the flexure moment is minimum when depth of grid kept same.

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